

SiC Resistivity Monitoring; A look at Novel Methods

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ABSTRACT

The market for SiC devices is growing rapidly in Asia, US and Europe. Applications include heterojunction transistors where SiC emitters allow forming high gain, high speed, and radiation hardened devices. SiC is particularly attractive for the power device manufacturers due to its wide band gap and high thermal conductivity.

For all applications, the electrical properties of the SiC epitaxial layer, such as doping density or resistivity are mostly critical. Conventionally, Mercury Probe Schottky CV has been used for SiC resistivity measurement. Hg probe CV is a well developed method but often requires a surface treatment and is contaminating. This paper presents several novel methods for determining the carrier density in SiC. One method involves the use of a non-destructive and non-contaminating Elastic Material probe (EM-probe) [1]. MOS CV measurements, both equilibrium and non-equilibrium, can be made with this probe. The small area and probe oxide layer reduce the need for surface treatment and, statistically reduce the chance of forming a contact on a defect site. Additional parasitic effects, such as dissipation factor and leakage are reduced significantly, as well. Another presented alternative method that allows carrier density profiling in SiC utilizes conductive rubber probe with the contact diameter about 0.5 mm.

An example of EM-probe MOS CV measurement of a SiC Epitaxial layer is shown in Figure 1. Figure 2 shows a correlation plot between Hg probe and EM-probe for several samples. Samples 4 and 5 could not be measured with the standard Hg probe due to the surface issues, while EM-probe MOS CV measured these samples readily.

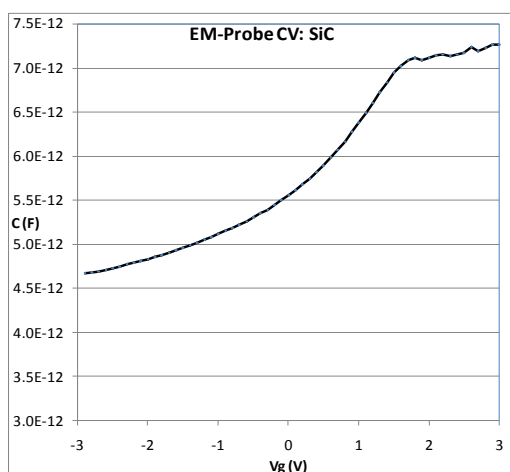


FIGURE 1. EM-probe MOS CV on SiC Epi.

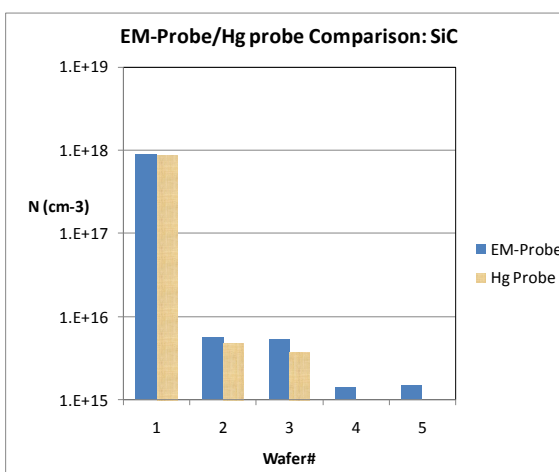


FIGURE 2. EM-probe vs. Hg probe comparison

Key words: Nano-electronics Materials and Devices; Novel Measurement Methods, SiC

REFERENCES

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